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Description

Method of Positioning a Seal in a Groove of a Bore in a Housing

BACKGROUND OF INVENTION

[0001] This invention relates to a method of locating a seal in a groove in a bore of a housing.

[0002] In many applications wherein pistons are used to pressurize fluid in bores it is necessary to provide seals to prevent fluid from moving past the piston and rather that being communicated to a system. Most often the piston has grooves therein for retention of seals and the bore in a housing has a smooth surface for its entire depth. It has been suggested that it may be beneficial to reverse the sequence with the grooves being located in the housing and the pistons being made smooth. When this type structure is employed it can be difficult to install a seal within a groove that is located a substantial distance from the end a bore without twisting the seal. If a seal is twisted and a piston is installed it is possible to damage

the seal that would need to be replaced and as a result considerable extra time and effort is required to manufacture a product.

SUMMARY OF INVENTION

[0003] It is a primary object of this invention to provide a method of locating a seal in a groove of a bore in a housing without damage to a sealing surface during installation.

[0004] According to this invention, a cylindrical seal is placed on a plurality of projections that extend from a cylindrical body of a fixture; the cylindrical seal is deformed into a C-shape and at least one of the projections is repositioned to hold the cylindrical seal in the deforming C-shape; the cylindrical body with the deformed cylindrical seal is inserted into the bore until in the deformed cylindrical seal is in radial alignment with the groove; and at least one of the projections is retracted to allow the cylindrical seal to radially expand from the C-shape to a circular shape and fill the groove to complete its placement in the housing.

[0005] An advantage of this invention resides an ability to position a seal in a groove within a bore of a housing without placing a twisting moment on the seal during installation.

[0006] A further object of this invention relates to a capability of

positioning a seal in a groove within a bore of a housing without twisting independent of the location of the groove from an end face of the housing.

Brief Description of Drawings

[0007] Figure 1 is a perspective sectional view of a housing having a cylindrical bore with a groove therein for receiving a seal having an internal diameter that is smaller than the diameter of a bore;

[0008] Figure 2 is an exploded view of a tool for installing the seal of Figure l in the groove of the housing;

[0009] Figure 3 is a perspective view illustrating a first step in locating the seal on the tool of Figure 2;

[0010] Figure 4 is a perspective view illustrating a second step in locating the seal on the tool of Figure 2;

[0011] Figure 5 is a view taken along lines 5-5 of Figure 4;

[0012] Figure 6 is a perspective view illustrating a third step in locating the seal on the tool of Figure 2;

[0013] Figure 7 is a perspective sectional view of the tool of Figure 6 on inserted in the bore of the cylindrical body of Figure 1; and

[0014] Figure 8 is a perspective sectional view of the housing of Figure 1 with a seal inserted in the groove.

DETAILED DESCRIPTION

[0015] Figure 1 is a perspective view of a housing 10 with a cylindrical bore 12 therein having a diameter D^1 and a groove 14 located a fixed distance "L^1" from a first end 16 and a seal 20. The bottom 18 of the groove 14 has a diameter D^2 while the seal 20 is defined by a ring having an peripheral diameter D^3 and an axial diameter D^4 and wherein the peripheral diameter D^3 is substantially equal the diameter D^2 of the bottom 18 of groove 14 and the axial diameter D^4 is smaller than the diameter D^1 of the cylindrical bore 12 such that when a piston is inserted in the cylindrical bore 12, a radial seal is produced. The distance L^1 can vary in housing 10 and when groove 14 is more that a predetermined distance from end 16, a seal 20 may be twisted during installation such that when a piston is located in cylindrical bore 12 the seal may be damaged. To prevent the occurrence of twisting during installation it is desirable to utilize a tool 50 as illustrated in Figure 2 to position a seal 20 in cylindrical bore 12 according to the method of the present invention.

[0016] Tool 50 is defined by a cylindrical body 52 having a first end 54 and a second end 56 with a first diameter 58 that corresponds to diameter D^1 of cylindrical bore 12 that ex-

tends from the first end 54 to a shoulder 60 and a second diameter 62 that extends from shoulder 60 to the second end 56. The distance from the first end 54 to shoulder 60 is equal to the distance L^1 but may be adjusted through the use of a space 64 (shown in dashed lines) to account for a different location of groove 14 from end 16 of housing 10. Tool 50 has an axial projection 66 that extends from end 54 and a plurality of axial bores 68 and 70 that extends there through from the first end 54 to the second end 56. The axial projection 66 and axial bores 68 and 70 are located in a same radius R^1 about the axis of the cylindrical body 52. Tool further includes a first pin 72 that is associated with the first axial bore 68, a second pin 74 that is associated with the second axial bore 70 and a third pin 76.

METHOD OF POSITIONING A SEAL IN A BORE

[0017] When a seal 20 is placed in a bore 12 of a housing 10 a first step is to determine a distance L^1 that a groove 14 is from an end 16 of the housing 10. If the distance L^1 for a tool 50 is different from the distance L^1 for housing 10 a spacer 64 would be placed on diameter 58 so that the distances L^1 are identical, in the following steps we will assume that the distances L^1 are equal. A seal 20 is lo-

cated on the axial projection 66 and the first pin 72 is inserted in the first axial bore 68 such that an end 71 thereon extends past the end 54 of the cylindrical body 52 and the seal 50 as illustrated in Figure 3.

[0018] The third pin 76 is brought into alignment with tool 50 adjacent the first diameter 58 and moved in a radial direction toward the cylindrical body 52 to engage seal 20 and applying a radial force to cylindrical seal 20 to deform the cylindrical seal 20 with respect to projection 66 and end 71 of first pin 72 into an approximate C-shape as illustrated in Figure 4. The now C-shape cylindrical seal 20 has an overall dimension that is smaller than a diameter 58 of the cylindrical body 52, see Figure 5 and as a result would not engage the cylindrical bore 12 during insertion into groove 16. The third pin 76 is initially inserted into the second axial bore 70 to retain the cylindrical seal 20 in the C-shape until the second pin 74 is inserted in the second axial bore 70 and an end 75 thereon extends past the first end 54 of the cylindrical body 52 to push the third pin 76 out of the second axial bore 70 and engage the cylindrical seal 20 and maintain the C-shape cylindrical seal 20 on the end of tool 50 as illustrated in Figure 6. For some applications, it may be desirable to include a flat

73 only shown in drawing 6 on pin 72 that would engage a corresponding indentation or stop 53 on cylindrical body 54 to define a locking arrangement to assure that the first 72 and second 74 pins remain in a fixed location during a later insertion into bore 12 of housing 10.

[0019] The tool 50 with the C-shape cylindrical seal 20 on the end thereof is inserted into cylindrical bore 12 of housing 10 until rib or shoulder 60 on tool 50 engages end 16 to radially align the C-shape cylindrical seal 20 with groove 16, see Figure 7. When the C-shape cylindrical seal 20 is aligned with groove 16, the first 72 and second 74 pins are retracted from the cylindrical body 52 such that the cylindrical seal 20 resiliently expands from the C-shape to a circular shape to fill groove 16 as illustrated in Figure 8. In some installations, it may be desirable to assist in the seating of the seal 20 in groove 16 and this can be achieved by rotating the cylindrical body 52 in bore 12 to compress the seal 20 in groove 16 by projection 66. Thereafter, the cylindrical body 54 is removed from cylindrical bore 12 to complete the installation of the installation of the seal 20 in housing 10. Thus, seal 20 has been positioned in groove 16 without any twisting such that a piston may now be inserted into cylindrical bore 12 and

engage seal 20 without damage to seal 20.